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Ohio State Engineer

Title: Putting Scrap Rubber to Work

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Issue Date: 1942-11

Publisher: Ohio State University, College of Engineering

Citation: Ohio State Engineer, vol. 26, no. 1 (November, 1942), 9, 18.

URI: http://hdl.handle.net/1811/35866

Putting Scrap Rubber to Work

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One of the ways of easing the critical rubber situation of war-time is the utilization of so-called "reclaimed rubber." This rubber is not designed to replace, but to supplement new rubber in the manufacture of rubber goods. The reclaimed rubber does not have the tensile strength or elongating properties of raw rubber, but in many goods it can replace raw rubber, and in some instances is even superior to the crude variety.

Though the reclaiming of scrap rubber has only recently become of nationwide public interest, reclaiming has long been an important source of rubber for many industries. Indeed, patents were issued as early as 1855 (just 16 years after Charles Goodyear discovered vulcanization) for reclaiming processes. Several methods were patented before the turn of the century, but only three have been of prime significance in later development. Beer, in 1855, boiled scrap with lye, but the resulting product was hard and unworkable. The first usable process was devised by Colonel Chapman Mitchell in 1881. Colonel Mitchell destroyed the fibers in the scrap by boiling it with sulfuric acid in lead lined tanks. The scrap was then freed from acid by washing, and heated to 300° in closed vessels for 24 hours. Then, in 1899, Arthur Marks combined the desirable characteristics of these two operations, and evolved the "alkali process," which remains to this date the most satisfactory method of reclaim. He used alkali to digest the fibers, and then softened the rubber by heating.

Out of its crude beginnings in the hands of Marks, rubber reclaiming has grown into a large and flourishing industry.

The present day process for reclaiming rubber may be divided into three basic operations: preparation, digestion, and refining.

The scrap rubber, as it is received from the dealer, is combined with many substances, principally metallic, which must be removed before digestion can be carried out. For example, the wire beads must be removed from tire casings, and valves must be taken from inner tubes. After foreign material has been separated, the scrap is chopped into smaller pieces, and ground, either between rolls, or through shredders. The ground scrap may be from one-fourth to one inch mesh size. Then it is usually passed over magnetic separators, which remove remaining small pieces of metal.

The next step consists of digestion of the ground scrap with caustic soda at high temperature and pressure. This is accomplished by charging the scrap into large autoclaves of 4,000 to 6,000 gallon capacity, together with a 4 to 6 percent solution of sodium hydroxide. The digestors are provided with jackets for heating with steam under pressure. They are fitted with agitators to assure con-

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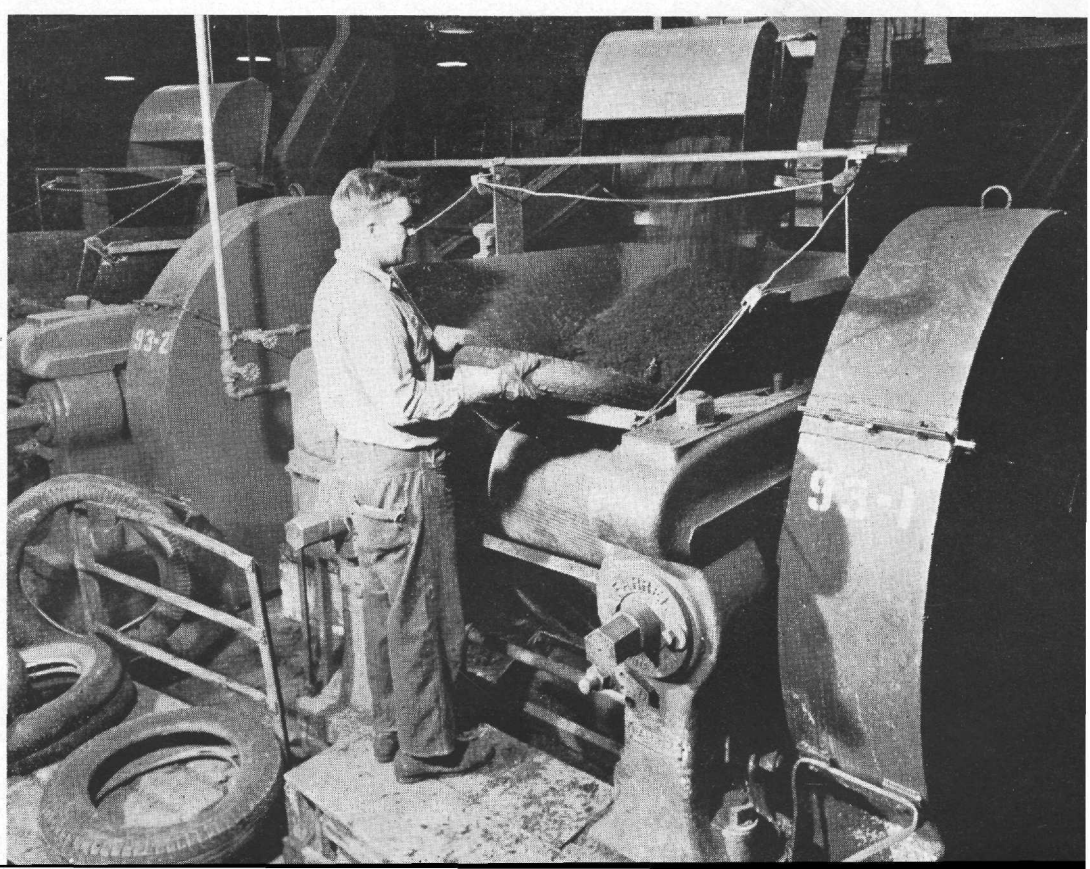

Grinding up the old tires from which the beads have been removed, is the first operation in the making of reclaimed rubber. The pulverized material is then placed in a de-vulcanizer where caustics eat the cotton from the rubber.

Courtesy B. F. Goodrich Co.

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stant mixing. Digestion is carried out under steam pressures of 150 to 200 pounds per square inch from 10 to 20 hours. During digestion, softening agents are usually added, whose function is to swell the rubber and to facilitate the plasticizing operation. The result of the digestion is to convert the cellulose of the fibers to sodium carbonate and other cellulose derivatives which are carried away during washing.

The rubber after digestion is a soft, sticky mass, and is washed with water to remove cellulose disintegration products, excess alkali, and the products of the reaction of sulfur with the alkali. It is not practicable to remove all the alkali, but less than one percent remains in the washed product. Residual water is expelled under pressure, and the batch is dried in currents of heated air.

The dried product, a loosely coherent sheet, is then worked in roll mills to break up the larger particles and to produce a uniform consistency. During this period softeners and fillers may be added to improve the product.

The final step in the reclaiming operation is refining. The batch is first passed through heated rolls as close together as .003 inches. It is then strained through screens of from 20 to 30 mesh per inch. Straining removes metal and other foreign matter still remaining, and further plasticizes the mass. The rubber is again sent through refining rolls, and the sheet is wound on drums to one-inch thickness, which is cut off in slabs. The rubber is then ready for shipment.

While reclaimed rubber is inferior to crude rubber in many ways, it nevertheless has some desirable characteristics. It is softer and more easily worked than raw rubber, and can be specially adapted to certain industries. Reclaim finds extensive use in such articles as hose, heels, rubberized fabrics, rubber footwear, mats, and hard rubber goods. Although of little use in the manufacture of automobile tires, reclaim can be used conveniently in the manufacture of camelback for retreading and recapping purposes.

In recent years the use of reclaim has amounted to about half the quantity of crude rubber employed, the present reclaiming capacity of this country being 350,000 tons annually. Considering the fact that 90 percent of the world's rubber producing territory is in enemy hands at the present time, an adequate supply of reclaim is vital to allow crude rubber and synthetics to be utilized where they are most needed.